

STATE OF ALASKA

Jay S. Hammond, Governor



Annual Performance Report for

INVENTORY, CATALOGING AND POPULATION
SAMPLING OF THE SPORT FISH AND SPORT
FISH WATERS IN UPPER COOK INLET

by

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ALASKA DEPARTMENT OF FISH AND GAME

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Section C

Study G- I

Inventory and Cataloging

Job No. G-I-E

Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Bristol Bay Area

Louis A. Gwartney
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RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations
of Alaska

Project No.: F-9-10

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-D Job Title: Inventory, Cataloging and
Population Sampling of the
Sport Fish and Sport Fish
Waters in Upper Cook Inlet

Period Covered: July 1, 1977 to June 30, 1978.

ABSTRACT

Minnow trapping was conducted in the Big Lake watershed from June 20 to October 13, 1977 to determine species composition, abundance, growth rates, and migrational habits of salmonids. Minnow traps were fished a combined total of 8,059 hours. Highest salmonid densities occurred in Fish Creek in the area immediately below Big Lake. Coho salmon, Oncorhynchus kisutch (Walbaum), was the most numerous salmonid species in all areas sampled. Data are presented which indicate that salmonid species composition in an area is primarily a function of density rather than habitat preference. Rearing coho salmon appear to have reached their maximum rearing density in the upper portion of Fish Creek.

Growth curves for age 0+ and I+ coho salmon rearing in Fish Creek and Meadow Creek are presented. Growth rates of age 0+ coho salmon in Meadow Creek are slightly higher than in Fish Creek, while age I+ coho salmon growth rates in Meadow Creek are considerably higher than those age I+ coho in Fish Creek.

A creel census was conducted on nine lakes in the Kepler Lake Complex. It was determined that 70% of the fishermen interviewed preferred fishing for rainbow trout, Salmo gairdneri (Richardson), and 63% preferred to catch large numbers of pan-sized fish rather than fewer large fish.

The average angler catch rate in seven rainbow trout lakes was 0.13 trout/hour while catch rates were 0.60 fish/hour in the lake stocked with coho salmon. The estimated harvest on all nine lakes was 2,136 fish and a total of 5,854 angler days were expended during the period of the census.

Chinook salmon, O. tshawytscha (Walbaum), populations in Matanuska-Susitna Valley streams were the second highest ever recorded for the region. In 1977 the total chinook escapement was 17,028, which is 14% lower than the highest escapement which occurred in 1976.

BACKGROUND

The Fish and Meadow Creek investigation was initiated in 1976 for the reasons stated by Watsjold (1977). The initial year of the project proved to be a success, and a better understanding of the population dynamics of salmonids in the Big Lake drainage resulted. This project also revealed how to effectively utilize minnow traps to obtain the information needed to complete the objectives of the study. Increased knowledge on the use of minnow traps will benefit similar studies that will undoubtedly take place in future years.

The Youth Conservation Corp (YCC) assisted in data collection during the 1977 summer as they did during the 1976 summer field season. The YCC was able to work on the project through August. The project was continued into October by staff biologists.

The Fish and Meadow Creek investigation will not be continued due to project priorities. The project has provided data that will increase understanding of rearing salmonids in the Big Lake drainage. The complexity of the population dynamics in the drainage are such that to obtain much of the desired data would require an extensive research project involving a considerable expenditure of funds, which are not currently available.

Life history investigations utilizing minnow traps were started on Willow Creek during the fall of 1977. Chinook salmon is the primary species being studied. This study is continuing through the winter and will be discussed in next year's report.

A creel census was initiated on nine lakes located near Palmer. Counts were conducted during the 1975 and 1976 field season which provided background for a creel census design. There has long been a need to evaluate the return to the creel of stocked fish. All nine lakes had been rehabilitated and were being stocked on a regular basis with various species. The creel census is another means of determining the success of the stocking program in the Matanuska-Susitna Valley.

RECOMMENDATIONS

1. Life history investigations in the Big Lake drainage should be discontinued.
2. Life history investigations of chinook and coho salmon in tributaries of the Susitna River should begin.
 - a. Minnow trapping should be conducted on a regular basis in the Willow Creek drainage to determine species composition.
 - b. Growth rates of chinook salmon in the Willow Creek drainage should be determined.

- c. Migrational tendencies of chinook salmon in Willow Creek and other tributaries of the Susitna River should be determined.

OBJECTIVES

1. To determine and record the environmental characteristics of existing and potential fishery waters of the job area.
2. To investigate, evaluate and develop plans for the enhancement of anadromous and resident fish stocks.
3. To make recommendations for the proper management of various sport fish waters in the area and to direct future studies.

TECHNIQUES

Minnow trapping was conducted on Fish and Meadow creeks utilizing wire 1/4-inch mesh minnow traps. Fish Creek was divided into three index areas and Meadow Creek was considered a separate index area. A minimum of 10 numbered traps were fished daily in various types of stream habitat. Each trap was fished at the same location for approximately 24 hours and was checked at one to three hour intervals during the day. At the end of each day the traps received fresh salmon eggs and were left overnight. On each new sampling day all traps were moved to a new location in each index area and rebaited. A sampling schedule for the entire summer was devised and allowed for trapping to be conducted in each index area for a period of two or three days. Upon completion of trapping in all index areas the whole process was repeated.

Five salmonids were randomly selected from each trap daily, identified, measured, and placed in a prepared solution of formaldehyde. Daily samples from all traps were placed in the same jar and labeled accordingly. In addition to the daily preserved specimens, the first 100 salmonids captured each day were measured and released. These measurements were recorded on an additional form. The remaining fish in each trap were identified, counted and released back into the stream.

All coho salmon were checked to determine if their left ventral fin had been removed. All fin clipped coho were measured before being returned to the stream.

A form was used to record all appropriate data for each trap (Figure 1). Fork lengths of fish samples were recorded to the nearest millimeter. Water depth was recorded in centimeters at each trap site and bottom types were noted on the form. The trap location in relationship to the stream channel was recorded as well as general current velocity which was visually categorized as either sluggish, moderate, moderately swift, or swift. Catches were separated by time period. Upon completion of each day's

FISH - MEADOW CREEK INVENTORY

1. Index Area _____ 2. Trap No. _____ 3. Date _____

4. Time Set _____ Time Set _____ Time Set _____

Time Lift _____ Time Lift _____ Time Lift _____

5. Water Temperature _____ °F 6. Water Depth _____ (cm)

7. Bottom Type _____

8. Trap Location _____

9. Current Velocity _____ 10. Weather _____

11. Preserved Sample 12. Released Sample

<u>Species*</u>	<u>Length (mm)</u>	<u>Daytime Set</u>	<u>Overnight Set</u>
		<u>Species</u> <u>Numbers</u>	<u>Species</u> <u>Numbers</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

13. Released Silver Salmon - Left Ventral Clip

Lengths (mm)

14. Total Trap Hours _____ 15. Total Fish _____

16. Fish Per Hour _____

17. Additional Comments _____

* RB-rainbow, DV-Dolly Varden, SS-silver salmon, RS-red salmon, WF-white fish, C-Cottid, SB-stickleback, SK-sucker.

Figure 1. Form Used During the Fish and Meadow Creeks Fisheries Investigation.

trapping, total trap hours, total fish, and fish per trap hour were recorded at the bottom of the form.

Scales were read from salmonids at various sites to determine length ranges for each age class. Scales were pressed between glass slides and placed in the scale projector for examination.

Since the YCC was conducting the summer trapping, daily samples were checked each week to determine the accuracy of species identification.

Monofilament gill nets (125' X 6') having five mesh sizes ranging from 0.5 to 2-inch bar measure, were used to collect fish specimens. Nets were normally set for 24 hours in each lake.

Creel census of the Kepler Lakes Complex was statistically designed to estimate harvest and effort on nine lakes from April 30, 1977 through September 5, 1977. This period was stratified by week, weekend-holiday versus weekday, 4-hour period, and lake access. The sampling day was divided into four 4-hour periods between the hours of 6 a.m. and 10 p.m. Limited sampling was also conducted from 10 p.m. to 12 midnight. Within strata, sampling was random. Sampling was conducted at three access points, and frequencies were chosen in accordance with pilot study car counts conducted during the summer of 1975 and 1976. Anglers were interviewed during the sample periods to determine number of hours fished, number and species of fish caught, whether or not they fished from shore or a boat, and if they had finished fishing for the day.

Those people who were not fishing during the sample period were also interviewed on a separate form referred to as a questionnaire form.

Five questions were asked of fishermen to determine their preferences of fish species and size and what percent of the time they fished during the winter and summer. They were also asked whether they preferred developed or underdeveloped public facilities and how they rated the quality of Upper Cook Inlet stocked lake fishing.

Chinook spawning populations were enumerated by aerial, boat, and stream-bank surveys; while coho spawning populations were enumerated by foot surveys within established index areas. Chinook carcass data were collected and age classes were determined by length frequencies. Fork lengths were recorded to the nearest 0.1 centimeter and weight to the nearest 0.1 pound.

FINDINGS

Results

Fish and Meadow Creeks Fisheries Investigation:

As in 1976, this study was limited only to lotic environments. Watsjold (1977) gave a complete description of stream flows, fisheries resources,

stream configurations and special problems related to the Big Lake drainage.

The YCC was again available to conduct minnow trapping in Fish and Meadow creeks. The YCC program was expanded and crews were available until the end of August. Staff biologists continued the trapping through October.

The index areas established on Fish and Meadow creeks in 1976 remained the same for the 1977 study (Figure 2). Minnow traps were fished a total of 8,059 hours in the four index areas during the period June 20 to October 13. The primary species captured were coho salmon, Oncorhynchus kisutch (Walbaum); chinook salmon, O. tshawytscha (Walbaum); rainbow trout, Salmo gairdneri (Richardson); threespine stickleback, Gasterosteus aculeatus Linnaeus; ninespine stickleback, Pungitius pungitius (Linnaeus); and unidentified cottid and lamprey species. Coho salmon and rainbow trout catch rates are shown in Table 1.

Trapping revealed that coho catch rates were highest in Index #3, followed in declining order by Index #4, #1, and #2. Index #4 had the highest rainbow catch rate, followed by Index #3, #2, and #1.

Catch rates for 1976 and 1977 are graphically depicted in Figure 3. In 1977, coho catches equaled or exceeded catches from 1976 in all index areas. Rainbow trout catches in 1977 were the same or lower than the previous year in all but Index #4.

Salmonid species composition within each index area for 1976 and 1977 is shown in Table 2. In 1977 coho salmon numbers were completely dominant in all four index areas. In 1976 coho salmon numbers were dominant in all areas except in Index #2, where rainbow trout were most numerous.

Salmonid catch rates by percent in each index area for 1976 and 1977 are shown in Table 3. These data show the percent of salmonids residing in the four index areas. In 1977 coho salmon were more abundant than in 1976 in all index areas except #3. The catch rate in Index #3 was identical during both years while the catch rate in the other index areas in 1977 were almost exactly double what they were in 1976. In 1977 rainbow trout were more abundant than in 1976 in Index area #4. The percent composition and catch rates of rainbow trout in 1977 were much lower than in 1976 in Index area #2 and #3.

Age and growth data by index area were determined for salmonid samples. Table 4 shows average lengths by age group in each index area. Age 0+ coho averaged from 42.3 to 45.5 mm in length in Indexes #1, #2, and #3 during the June sampling. In Meadow Creek, age 0+ coho averaged 47.5 mm in June. When the sampling terminated in October, age 0+ coho averaged from 57.1 to 60.1 mm in length in the three Fish Creek index areas. Meadow Creek coho averaged 58.7 mm in length.

Age 1+ coho averaged from 74.2 to 75.2 mm in length in Fish Creek during June, while Meadow Creek coho had reached a length of 86.3 mm. The October

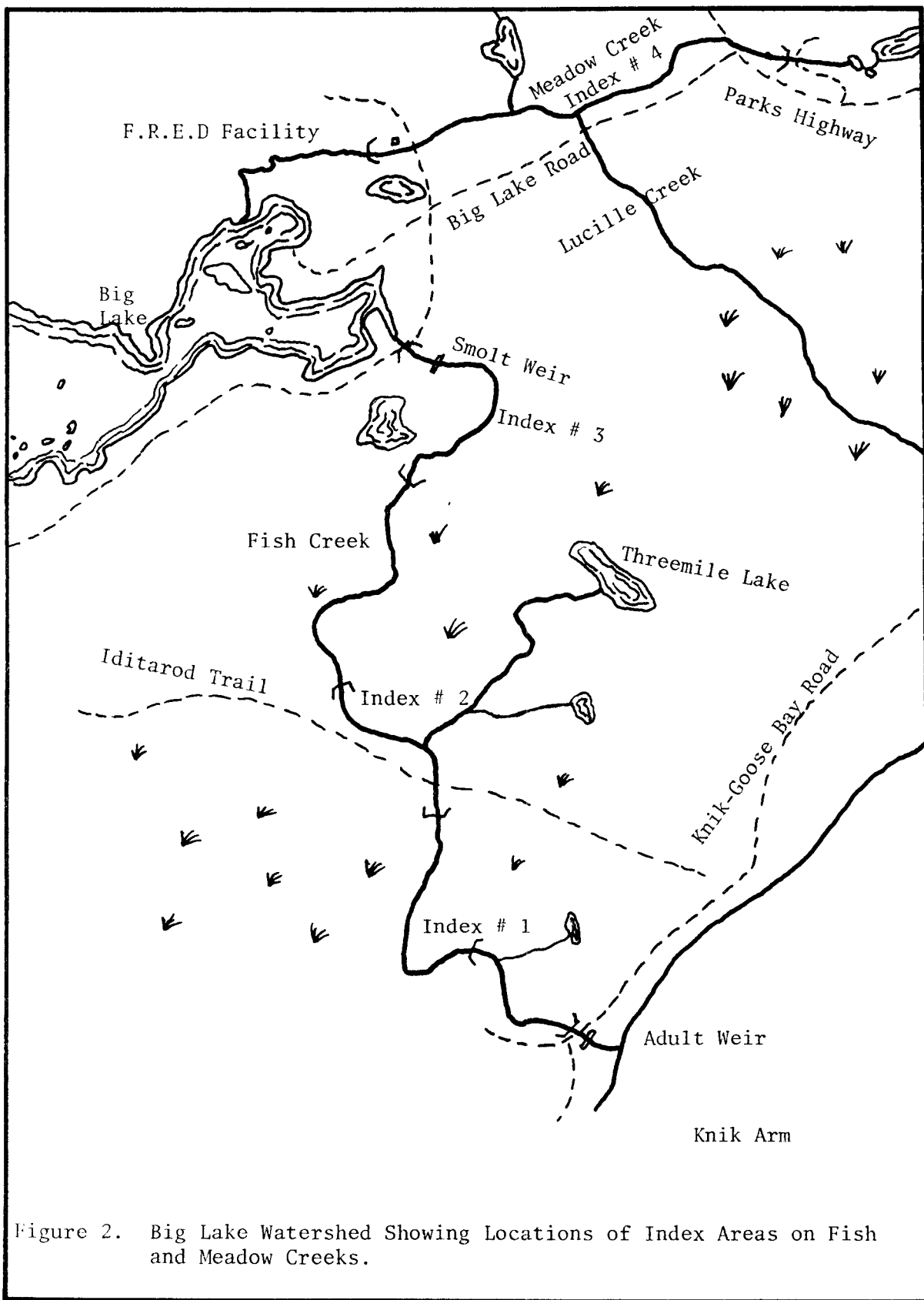


Figure 2. Big Lake Watershed Showing Locations of Index Areas on Fish and Meadow Creeks.

Table 1. Catch By Index Area and Species* in Fish and Meadow Creeks, 1977.

Index Area	Time Period	No. Traps	Total Trap Hr.	No. SS	Catch/ Trap Hr.	No. RT	Catch/ Trap Hr.
1	6/20-6/21	20	458	146	0.32	155	0.34
1	7/5 -7/6	20	468	321	0.69	72	0.15
1	7/27-7/29	30	518	376	0.73	40	0.08
1	8/11	10	54	74	1.37	16	0.30
1	10/12	<u>20</u>	<u>425</u>	<u>449</u>	<u>1.06</u>	<u>221</u>	<u>0.52</u>
Total		100	1,923	1,366	0.71	504	0.26
2	6/22-6/24	30	475	244	0.51	135	0.28
2	7/7	10	205	129	0.63	20	0.10
2	8/1-8/2	20	244	144	0.59	76	0.31
2	8/15-8/17	30	491	401	0.82	102	0.21
2	10/13	<u>20</u>	<u>455</u>	<u>345</u>	<u>0.76</u>	<u>183</u>	<u>0.40</u>
Total		110	1,870	1,263	0.68	516	0.28
3	6/27-6/28	20	447	504	1.13	114	0.26
3	7/11-7/12	20	446	366	0.82	25	0.06
3	8/3 -8/5	30	511	1,874	3.67	145	0.28
3	8/18-8/19	20	285	1,097	3.85	108	0.38
3	10/5	<u>20</u>	<u>433</u>	<u>878</u>	<u>2.03</u>	<u>385</u>	<u>0.89</u>
Total		110	2,122	4,719	2.22	777	0.37
4	6/29-7/1	30	464	310	0.67	163	0.35
4	7/13-7/14	20	437	368	0.84	100	0.23
4	8/8 -8/10	30	499	725	1.45	154	0.31
4	8/22-8/25	20	267	261	0.98	171	0.64
4	10/4	<u>20</u>	<u>477</u>	<u>326</u>	<u>0.68</u>	<u>618</u>	<u>1.30</u>
Total		120	2,144	1,990	0.93	1,206	0.56
Total All Index Areas		440	8,059	9,338	1.16	3,003	0.37

* SS - coho salmon
RT - rainbow trout

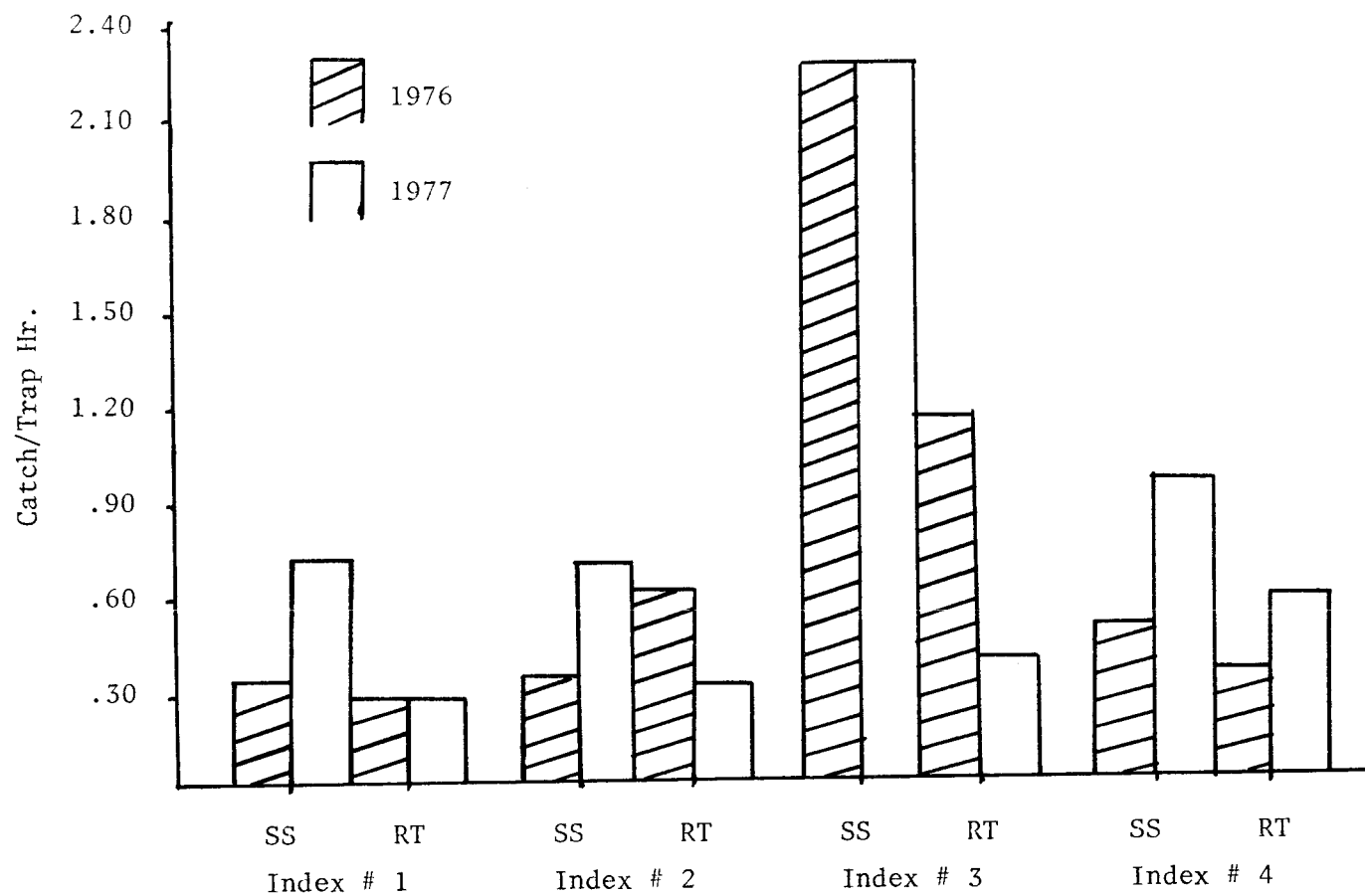


Figure 3. Catch Rates by Index Area, and Species in Meadow and Fish Creeks, 1976-1977.

Table 2. Species* Composition of Salmonids Within Each Index Area, 1976-1977.

			1976						Index 4		
Index 1			Index 2			Index 3			Index 4		
Species	No.	Percent	Species	No.	Percent	Species	No.	Percent	Species	No.	Percent
SS	645	55.3	SS	660	35.8	SS	3,764	68.0	SS	1,252	60.0
RT	522	44.7	RT	1,182	64.2	RT	1,770	32.0	RT	836	40.0
Total	1,167			1,842			5,534			2,088	
1977											
SS	1,366	73.0	SS	1,263	71.0	SS	4,719	85.9	SS	1,990	62.3
RT	504	27.0	RT	516	29.0	RT	777	14.1	RT	1,206	37.7
Total	1,870			1,779			5,496			3,196	

* SS - coho salmon
RT - rainbow trout

Table 3. Salmonid Catch Rates by Index Area, 1976-1977.

Index Area	1976 Catch/Trap Hour				Index Area	1977 Catch/Trap Hour			
	Coho	Percent	Rainbow Trout	Percent		Coho	Percent	Rainbow Trout	Percent
1	0.33	9.7	0.26	11.6	1	0.71	15.6	0.26	17.7
2	0.34	10.0	0.61	27.2	2	0.68	15.0	0.28	19.0
3	2.24	66.1	1.05	46.9	3	2.22	49.0	0.37	25.2
4	0.49	14.2	0.32	14.3	4	0.93	20.4	0.56	38.1

Table 4. Age and Average Lengths* of Coho Salmon and Rainbow Trout Captured in Each Index Area, 1977.

Date	Coho Salmon				Rainbow Trout				
	Age	n	\bar{x}	\pm SD	Age	n	\bar{x}	\pm SD	
<u>Index 1</u>									
6/20-6/21	0+	3	42.3	1.15	I+	8	72.1	7.19	
	I+	126	74.3	6.80	II+	44	103.8	11.34	
7/ 5-7/6	0+	51	48.3	3.91	I+	5	75.1	2.97	
	I+	160	75.1	7.17	II+	9	103.1	13.39	
7/27-7/29	0+	153	53.5	4.28	I+	4	76.3	2.22	
	I+	240	77.2	8.67	II+	11	95.9	11.25	
8/11	0+	50	56.1	4.76	I+	3	56.0	2.64	
	I+	19	76.6	8.19	II+	5	97.0	12.58	
10/12	0+	39	60.1	5.97	I+	12	65.0	6.06	
	I+	71	84.6	7.79	II+	45	105.0	12.06	
<u>Index 2</u>									
6/22-6/24	0+	18	43.6	2.85	I+	7	66.0	9.09	
	I+	212	74.2	7.54	II+	40	92.4	10.21	
	II+	1	128.0						
7/7	0+	29	47.9	3.54	I+	2	75.5	2.12	
	I+	81	76.4	8.44	II+	2	93.5	2.12	
8/1-8/ 2	0+	58	54.7	4.39	I+	3	71.0	5.29	
	I+	82	77.0	6.76	II+	8	92.6	9.58	
8/15-8/17	0+	206	55.2	6.16	I+	6	69.8	7.08	
	I+	78	79.8	7.27	II+	14	93.2	6.67	
10/13	0+	72	57.1	6.09	0+	5	46.8	4.38	
	I+	54	82.5	6.97	I+	10	65.3	7.25	
					II+	32	102.4	11.89	
<u>Index 3</u>									
6/27-6/28	0+	34	45.5	3.26	I+	3	64.0	5.29	
	I+	178	75.2	6.25	II+	10	93.1	11.09	
7/11-7/12	0+	85	49.0	4.39	I+	4	70.5	7.18	
	I+	171	75.4	6.79	II+	5	104.8	8.89	
8/3 -8/5	0+	209	53.7	4.58	I+	8	69.8	5.12	
	I+	189	77.8	5.75	II+	7	92.4	7.64	
8/18-8/19	0+	209	53.6	5.40	I+	2	72.0	2.82	
	I+	49	79.2	5.98	II+	1	89.0		
10/5	0+	74	59.7	6.00	0+	3	44.0	5.29	
	I+	45	83.1	9.22	I+	28	63.6	8.98	
					II+	34	100.8	13.48	
<u>Index 4</u>									
6/29-7/1	0+	11	47.5	2.95	I+	28	72.9	4.46	
	I+	213	86.3	8.02	II+	25	98.0	12.23	
7/13-7/14	0+	23	51.9	4.21	I+	11	74.2	6.06	
	I+	181	86.9	8.92	II+	5	89.6	5.94	
8/8 -8/10	0+	196	55.9	5.40	I+	21	71.2	8.05	
	I+	158	87.6	9.15	II+	14	105.4	12.77	
8/22-8/23	0+	158	56.6	6.66	I+	14	70.9	5.95	
	I+	52	88.8	8.27	II+	11	85.0	3.07	
10/4	0+	57	58.7	5.50	0+	1	46.0		
	I+	49	96.3	12.50	I+	21	70.4	8.60	
					II+	61	103.5	15.20	

* Lengths recorded in millimeters.

sampling revealed that age I+ coho in Fish Creek had reached a length of 82.5 to 84.6 mm. Age I+ coho in Meadow Creek had reached a length of 96.3 mm by October.

Figure 4 shows growth rates of different age coho salmon in Fish and Meadow creeks during the period of June to October. The growth curve indicates that age 0+ coho grew rapidly during June and July, after which their growth slowed considerably. Age I+ coho show a gradual growth increase throughout the summer.

Rainbow trout growth patterns are difficult to follow because of the small samples of age I+ individuals. Both age I+ and II+ rainbow growth rates are extremely variable.

Table 5 shows the percent composition of age groups of coho salmon in each index area for 1976-1977. In 1976 age 0+ coho numbers were dominant in all areas except Index #4. In 1977 age I+ coho dominated in all areas except Index #3.

Table 6 shows the percent composition of age groups of rainbow trout in each index area for 1976-1977. In 1976 age I+ rainbow trout were completely dominant in all four index areas, while in 1977 age II+ dominated all the samples from each index area.

Kepler Lakes Area Creel Census:

A creel census was conducted from April 30, 1977 through September 5, 1977 on Echo, Matanuska, Kepler, Bradley, Long, Victor, Irene, Harriet, and Canoe lakes.

At the 95% confidence interval an estimated 5,854 angler days were expended to catch 2,136 fish. Effort estimates were derived from interviews with 848 completed anglers, which represents 14.5% of the total estimated effort. Completed fishermen caught 409 fish, which represents 19.1% of the total estimated catch.

During the census period 2,017 anglers were contacted and 998 fish were recorded. These contacts include completed and non-completed fishermen and fishermen who fished at times other than during the sampling period. These totals represent 34.5% of the estimated effort and 46.7% of the estimated catch.

Table 7 shows sport fish harvest and effort estimates for the nine stocked lakes. For the seven rainbow trout lakes, catch estimates ranged from 0.06 trout/hour in Long Lake to 0.29 trout/hour in Irene Lake. The average rainbow trout catch rate for the seven lakes was 0.13 trout/hour. Victor Lake, which contains coho salmon, had a catch rate of 0.60 fish/hour, while Harriet Lake grayling catch rates were 0.14/hour. The total harvest of all species from the nine lakes was 2,136. The highest catches were from Victor Lake which contains coho salmon.

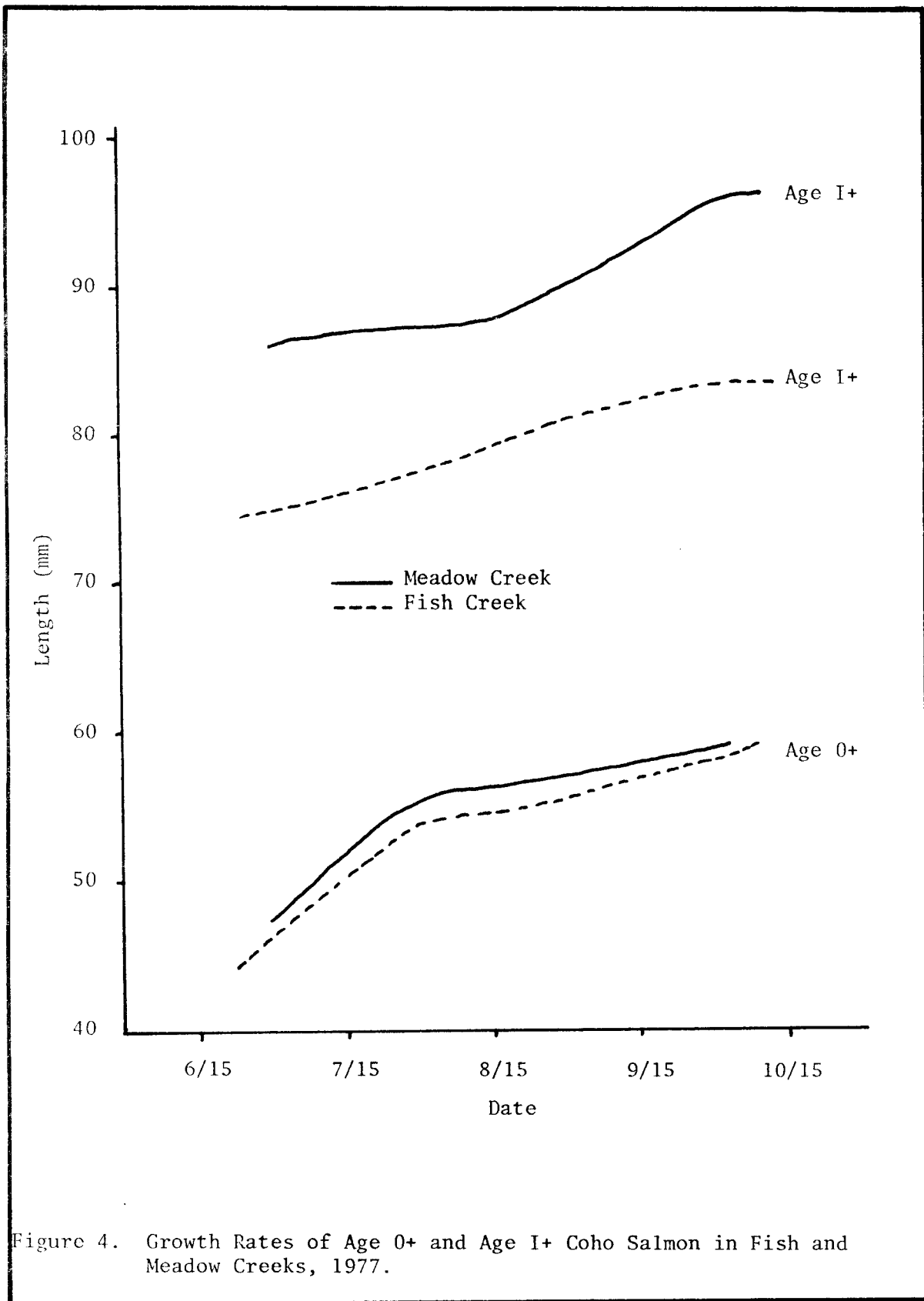


Table 5. Percent Composition of Age Groups of Coho Salmon in Each Index Area, 1976-1977.

Age	<u>1976</u> No.	Percent	Age	<u>1977</u> No.	Percent
<u>Index 1</u>			<u>Index 1</u>		
0+	57	54.8	0+	107	31.8
I+	47	45.2	I+	229	67.9
			II+	1	0.3
<u>Index 2</u>			<u>Index 2</u>		
0+	99	60.4	0+	180	43.9
I+	64	39.0	I+	229	55.9
II+	1	0.6	II+	1	0.2
<u>Index 3</u>			<u>Index 3</u>		
0+	204	77.3	0+	264	51.4
I+	60	22.7	I+	250	48.6
<u>Index 4</u>			<u>Index 4</u>		
0+	74	34.3	0+	188	42.6
I+	126	58.3	I+	253	57.4
II+	16	7.4			

Table 6. Percent Composition of Age Groups of Rainbow Trout in Each Index Area, 1976-1977.

1976			1977		
Age	No.	Percent	Age	No.	Percent
<u>Index 1</u>			<u>Index 1</u>		
0+	6	4.9	I+	32	21.9
I+	113	91.9	II+	114	78.1
II+	4	3.2			
<u>Index 2</u>			<u>Index 2</u>		
0+	3	1.3	0+	5	3.9
I+	202	87.1	I+	28	21.7
II+	27	11.6	II+	96	74.4
<u>Index 3</u>			<u>Index 3</u>		
0+	4	1.8	0+	3	2.9
I+	200	91.3	I+	45	42.8
II+	15	6.9	II+	57	54.3
<u>Index 4</u>			<u>Index 4</u>		
0+	80	32.1	0+	1	0.5
I+	165	66.3	I+	95	44.8
II+	4	1.6	II+	116	54.7

Table 7. Kepler Lakes Area Sport Fish Harvest and Effort Estimate,
April 30, 1977 to September 5, 1977.

Lake	Angler Day	Angler Hour	Harvest		Harvest/Hr.	Harvest/Day
Echo	966	2,173	356	RT	0.16	0.37
Matanuska	1,792	4,409	380	RT	0.09	0.21
Kepler	1,778	3,760	522	RT	0.14	0.29
Bradley	206	412	62	RT	0.15	0.30
Long	378	990	61	RT	0.06	0.16
Victor	348	900	543	SS	0.60	1.56
Irene	163	500	145	RT	0.29	0.89
Harriet	147	249	36	GR	0.14	0.24
Canoe	<u>76</u>	<u>139</u>	<u>31</u>	RT	<u>0.22</u>	<u>0.41</u>
Total	5,854	13,532	2,136*		0.16	0.36

* Comprised of 1,557 rainbow trout (RT), 543 coho salmon (SS), 36 arctic grayling (GR).

A total of 1,792 and 1,778 angler days were expended on Matanuska and Kepler lakes. In addition to these two lakes, Echo Lake had 966 angler days recorded. These three lakes accounted for 78% of the estimated effort on all lakes included in the census.

Shore fishermen (3,012) slightly outnumbered boat fishermen (2,842). Ninety percent of the boat fishermen were on Matanuska, Kepler, Bradley, and Victor lakes. The remaining five lakes were dominated by shore fishermen primarily due to accessibility. Fishing success for boat versus shore fishermen on Kepler and Bradley lakes revealed that boat fishermen had 71% better fishing than shore fishermen.

Table 8 shows effort and harvest data by sampling period. Only 3% of the anglers interviewed fished during the 6 a.m. to 10 a.m. period. Seventy-six percent of the effort occurred between the hours of 2 p.m. and 10 p.m. Harvest rates were also the lowest (0.04 fish/hour) during the early morning period while harvest rates during the remaining three periods were 0.19 to 0.20 fish/hour.

Table 9 shows effort and harvest data by month. A total of 48% of the effort occurred during May, while 22%, 16%, 9%, and 3%, occurred during June, July, August, and September, respectively. The remaining 2% was recorded on April 30, the first day of the census. Harvest rates were the highest in June and September and lowest in April.

Anglers averaged 2.57 hours per day on the weekend compared to 2.24 hours per day on weekdays. Catch rates on weekends was 0.20 fish per hour which was almost double the catch rate of 0.11 fish per hour on weekdays.

Periodic sampling was conducted between 10 p.m. and 12 midnight to determine what percent of the effort and harvest was missed by not sampling at this time. Analysis of this sampling period indicated that most probably no more than 15% of the total harvest and effort was missed during the 10 p.m. to 12 midnight period.

Effort and harvest data collected from anglers who were not fishing during a sample period were recorded on the questionnaire form and compared to data used to estimate harvest and effort levels. A total of 375 completed anglers and 434 non-completed anglers were contacted during periods other than the sampling period. Although catch rates for sample periods versus non-sample periods were highly correlated ($r=0.83$), the non-sample period rates were about 35% higher. Hours per angler did not differ significantly between the two sets of data.

Approximately 525 responses to five questions regarding Cook Inlet Basin stocked lakes were received either by direct interview or from handouts available at the Kepler Lake access point, Palmer office, and Anchorage office. A total of 70% of the fishermen preferred to fish for rainbow trout, 19% picked landlocked coho salmon, and 11% named grayling, Thymallus arcticus (Pallus), for their first choice. Sixty-three percent of the fishermen preferred to catch a few large fish, while 37% like to catch

Table 8. Effort and Harvest Data by Sampling Period Collected from Completed Anglers During Kepler Lakes Area Creek Census, 1977.

Sampling Period	Angler Day	Angler Hours	Harvest*	Angler Hours/ Angler Day	Harvest/ Hour
6 a.m. 10 a.m.	27	45.5	2	1.69	0.04
10 a.m. 2 p.m.	173	457.0	92	2.64	0.20
2 p.m. 6 p.m.	333	738.9	142	2.22	0.19
6 p.m. 10 p.m.	315	876.3	173	2.78	0.20

* Includes all species.

Table 9. Effort and Harvest Data by Monthly Period Collected from Completed Anglers During Kepler Lakes Area Creel Census, 1977.

Monthly Period	Angler Day	Angler Hours	Harvest*	Angler Hours/ Angler Day	Harvest/ Hour
April	19	51.1	2	2.69	0.04
May	406	999.2	165	2.46	0.17
June	185	539.6	141	2.91	0.26
July	135	302.5	58	2.24	0.19
August	77	162.3	27	2.11	0.17
September	26	63.0	16	2.42	0.25

* Includes all species.

large numbers of pan sized fish. When asked what percent of their fishing time was spent during the winter, 26% fished from 10% to 50% of their time in the winter and only 5% spent more than 50% of their fishing time during the winter period. Fifty-nine percent of the fishermen indicated that they favored fishing stocked lakes having few or no public facilities while the remaining 41% liked fully developed facilities such as campgrounds and boat launches. When fishermen were asked to rate the current quality of stocked lake fishing in the Cook Inlet Basin, 7% rated the quality excellent, 40% rated it good, 39% rated it fair, and 14% rated it as poor.

Lake Stocking Evaluations:

Sampling of stocked lakes is conducted to evaluate and develop present stocking practices aimed at enhancing resident fish stocks.

In 1977, ten stocked lakes were sampled in late fall and early winter, with variable mesh gill nets (Table 10). All of the lakes sampled contained coho salmon. Rainbow trout plants are being evaluated under a project that is designed to provide guidelines for rainbow trout stocking programs.

Gill net catch data and stocking histories are presented in Table 10. Lucille and Finger lakes were stocked on May 17, 1977 with coho weighing 512/lb. and 698/lb., respectively. Loon, Rocky, and South Rolly lakes were stocked on June 8, 1977 with coho weighing 623/lb. Mean lengths of age 0+ coho after six months of residency ranged from 106 mm in Lucille Lake to 119 mm in Finger Lake. Lucille Lake coho continue to decrease in size since the reinfestation of threespine sticklebacks. Age 0+ coho, which normally attain a mean length of 150-160 mm after six months residency, declined to 125 mm in 1976 and in 1977 average only 106 mm.

In 1976 four lakes were stocked on May 28 with coho weighing 341/lb. and an additional four lakes were stocked on June 1 with coho weighing 298/lb. After 18 months of residency coho ranged from 163 mm in length in Benka Lake to 271 mm in Victor Lake. Christiansen, Finger, Memory, and Victor lakes all contained age I+ coho over 232 mm in length and none of these lakes contained competitor species. Benka, Lucille, Prator, and Rocky lakes contained age I+ coho between the lengths of 163 mm-181 mm. These four lakes contained competitor species, primarily threespine sticklebacks. Lucille Lake is one of the most productive lakes in the Matanuska Valley, while Memory is one of the least productive lakes in the area. It appears that threespine sticklebacks may have a greater influence on growth rates than does the chemical-physical nature of the waters.

Chinook Studies:

The 1977 chinook salmon escapement surveys on east side Susitna River tributaries and tributaries of the Talkeetna and Chulitna rivers were conducted from July 19 to August 3. Stream flows were normal and counting conditions were ideal. A total of 14,199 chinook were actually observed during escapement surveys. Watsjold (1974) found that during aerial surveys chinook were observed in alpine streams with 70% efficiency and

Table 10. Gill Net Results and Stocking Histories of Managed Lakes, Matanuska-Susitna Valleys, 1977.

Lake	Date Sampled	Species*	Age Class	n	Length (mm)			Catch/ Net Hr.	Date Stocked	Total Number	Per Lb.	Per Acre
					\bar{x}	+ SD	Range					
Benka	10/21/77	SS	I+	71	163	28.12	105-203	0.99	5/28/76	23,000	341	187
		SS	III+	7	270	19.16	241-303	0.10	7/19/74	7,811	146	64
Christiansen	10/25/77	SS	I+	120	232	13.70	201-293	2.60	5/28/76	26,900	341	150
Finger	11/28/77	SS	O+	39	119	14.39	106-175	0.89	5/17/77	72,500	698	200
		SS	I+	25	227	16.76	198-267	0.57	5/28/76	72,500	341	200
Loon	10/25/77	SS	O+	19	115	5.22	107-126	0.40	6/8/77	10,800	623	100
		SS	II+	35	268	16.64	237-304	0.74	7/22/75	10,800	293	100
		SS	IV+	2	307	0.71	306-307	0.04	8/8/73	16,135	133	150
Lucille	11/28/77	SS	O+	14	106	4.46	100-114	0.33	5/17/77	72,500	512	200
		SS	I+	34	168	8.02	152-188	0.80	5/28/76	72,500	341	200
Memory	11/28/77	SS	I+	52	245	12.51	215-270	1.21	6/1/76	16,600	298	200
Prator	10/25/77	SS	I+	34	171	6.29	160-183	0.73	6/1/76	9,800	298	100
		SS	IV+	5	225	10.02	219-243	0.10	8/10/73	15,000	163	153
Rocky	11/22/77	SS	O+	106	113	4.48	102-127	2.21	6/8/77	11,800	623	200
		SS	I+	177	181	9.80	162-228	3.69	6/1/76	11,800	298	200
South Rolly	11/18/77	SS	O+	2	108	4.24	105-111	0.04	6/8/77	11,300	623	100
		SS	I+	10	265	34.46	209-313	0.21	6/16/76	26,100	209	230
Victor	11/15/77	SS	I+	25	271	15.23	180-322	0.58	6/1/76	2,800	298	207
		SS	II+	2	383	14.84	372-393	0.04	6/18/75	2,700	489	200

* Key: SS = coho salmon.

chinook were observed in streams flowing through heavily forested areas with 55% efficiency. Based on these findings, as well as foot counts, it was estimated that the 1977 chinook escapement was 17,028, which is 14% lower than the previous high escapement of 19,900 in 1976 (Table 11).

Individual stream counts are presented in Table 12. In 1977 several streams had higher escapements than were recorded in 1976. Montana Creek had almost identical escapement levels in 1976 and 1977. Willow, Prairie, and Chunitna creeks are major chinook producers which had lower escapement levels in 1977 than in 1976. Chinook escapements in 1976 and 1977 were exceedingly strong in all systems as compared to years prior to 1976.

Chinook carcasses were collected from Willow Creek, Montana Creek, and Chulitna River. Length and age data collected from carcasses are shown in Tables 13, 14, and 15.

In Willow Creek a sample of 140 chinook carcasses had a mean length of 100.0 ± 13.97 cm. Males and females averaged 113.3 and 105.4 cm in length, respectively, and the male to female sex ratio was 1:1.4. Age composition as determined by length frequencies indicated 2.1% were age 1.2, 9.3% were age 1.3, and 88.6% were age 1.4 (Table 13).

In Montana Creek a sample of 156 chinook carcasses had a mean length of 95.9 ± 21.52 cm. Males and females averaged 91.1 and 103.1 cm in length, respectively, and the male to female sex ratio was 1.5:1. Age composition indicated 3.2% were age 1.1, 18.6% were age 1.2, 13.5% were age 1.3, and 64.7% were age 1.4 (Table 14).

A total of 255 chinook carcasses were sampled on the middle fork of Chulitna River. The fish had a mean length of 94.2 ± 12.69 cm. The sex ratio of males to females was 1:1.3 and males averaged 94.9 cm, while females averaged 93.6 cm in length. Age composition indicated 0.4% were age 1.1, 5.9% were age 1.2, 40.8% were age 1.3, and 52.9% were age 1.4 (Table 15).

Figure 5 depicts length frequency by percent of chinook carcasses collected in Willow Creek, Montana Creek, and Chulitna River. In Willow Creek, 88.6% of the carcasses were six-year-old fish in 1977 compared to 77.4% in 1976. Females also dominated carcass samples in Willow Creek. Montana Creek had 64.7% six-year-old fish, which is less than the 76.1% recorded in 1976. In Montana Creek, there was a strong showing of four-year-old males in 1977. The 1977 Chulitna River sample was very similar to the 1976 sample. Chinook escapements are primarily made up of five and six-year-old fish in this system.

Coho Studies:

In 1977 foot surveys were conducted in escapement index areas on only four streams to estimate spawning coho populations. Heavy rains persisted throughout the last half of September when coho normally spawn. No escapement estimates could be made on established index areas in Wasilla and

Table 11. Total Chinook Salmon Escapement in East Side Susitna Tributaries and Tributaries of the Chulitna and Talkeetna Rivers, 1972-1977.

Year	Observed Counts	Expanded Counts
1972*	1,775	2,300
1973	8,086	8,900
1974	3,556	4,100
1975	1,247	1,500
1976	16,753	19,900
1977	14,199	17,028

* Does not include Prairie Creek.

Table 12. Observed Chinook Escapement Counts, Upper Cook Inlet, 1969-1977.

Stream	Ground Surveys								
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Willow Creek	290	640	165	370	1,074	402	177	1,660	1,065
Montana Creek	150	161	44	317	527	280	229	1,445	1,443
Moose Creek		126	40	21	36	32	55	116	153
Prairie Creek					4,190	1,498	369	6,513	5,790
	Aerial Surveys*								
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Chunilna Creek	375	58**	5**	91	(292)	(283)	(101)	(1,237)	769
Kashwitna River (North Fork)	0		1	31	(183)	103	(33)	(203)	(336)
Little Willow Creek		45**		99	(371)	(139)	(103)	(833)	(598)
Sheep Creek				101	(482)	202	42	(455)	(630)
Indian River				35	(122)	102	31	537	393
Portage Creek				68	(174)	260	32	702	374
Chulitna River (East Fork)					(42)	41	7	112	168
Chulitna River (Middle Fork)					(219)	159	55	1,870	1,782
Chulitna River (Main Stem)								124	229
Prairie Creek		820	630		(3,286)				
Goose Creek						41	13	160	(133)
Little Susitna River					(374)			(405)	
Honolulu Creek								24	36
Byers Creek								53	69
Troublesome Creek								92	95
Bunco Creek								112	136

* Helicopter surveys in parenthesis, all other aerial counts are fixed wing aircraft.

** Poor counting conditions.

Table 13. Age and Length Data from Chinook Carcasses, Willow Creek, 1977.

Age	Male Length (cm)				Female Length (cm)				Total Combined Sexes			
	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD
1.2	3	5.1	68.7	1.52					3	2.1	68.7	1.52
1.3	3	5.1	88.7	9.29	10	12.3	91.5	3.20	13	9.3	90.8	4.86
1.4	53	89.8	117.2	7.49	71	87.7	107.4	5.92	124	88.6	111.6	8.22
Total	59	100.0	113.3	14.20	81	100.0	105.4	12.89	140	100.0	108.7	13.97

Table 14. Age and Length Data from Chinook Carcasses, Montana Creek, 1977.

Age	Male Length (cm)				Female Length (cm)				Total Combined Sexes			
	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD
1.1	5	5.3	42.4	8.35					5	3.2	42.4	8.35
1.2	29	30.9	64.1	4.49					29	18.6	64.1	4.49
1.3	12	12.8	86.3	6.82	9	14.5	89.3	4.52	21	13.5	87.6	6.02
1.4	48	51.0	113.8	9.01	53	85.5	105.5	4.64	101	64.7	109.4	8.17
Total	94	100.0	91.1	26.05	62	100.0	103.1	7.35	156	100.0	95.9	21.52

Table 15. Age and Length Data from Chinook Carcasses, Chulitna River, 1977.

Age	Male Length (cm)				Female Length (cm)				Total Combined Sexes			
	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD	n	%	\bar{x}	\pm SD
1.1	1	0.9	36.0						1	0.4	36.0	
1.2	13	11.8	62.8	3.07	2	1.4	65.0	4.24	15	5.9	63.1	3.15
1.3	28	25.5	90.7	3.77	76	52.4	89.0	4.17	104	40.8	89.5	4.12
1.4	68	61.8	103.6	13.07	67	46.2	99.8	2.93	135	52.9	101.7	9.66
Total	110	100.0	94.9	17.43	145	100.0	93.6	7.31	255	100.0	94.2	12.69

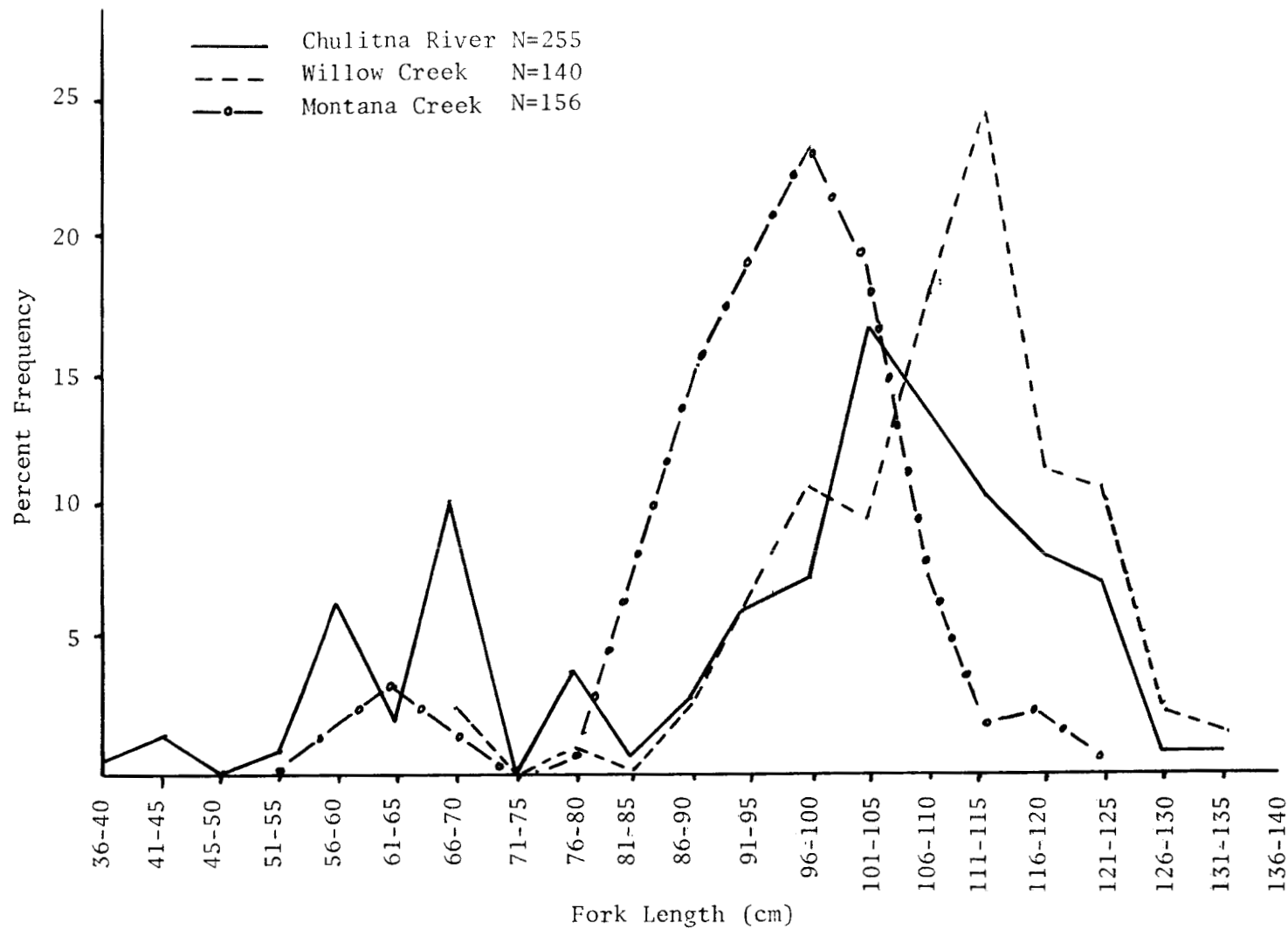


Figure 5. Length Frequency by Percent of Chinook Salmon Carcasses, Chulitna River, Montana Creek and Willow Creek, 1977.

Rabideux creeks. A summary of coho escapement counts in index areas is presented in Table 16. The Meadow Creek index area was not counted since coho are intercepted at the hatchery facility downstream from the index area.

Numerous foot counts were conducted along Cottonwood and Wasilla creeks during the normal period of coho migration. Very few coho were observed in either stream and sport catches were exceedingly low. Coho counts in 1977 through the Fish Creek weir were also lagging. Based on this information these three streams were closed to salmon fishing by emergency order on August 13.

Even with the closure, only 25 coho were enumerated in the Cottonwood Creek index area, which was the lowest escapement level observed since 1974. An additional 92 coho were observed in several other spawning areas in the drainage.

High water conditions prevented counts on Wasilla Creek; therefore, the effects of the closure could not be evaluated.

The weir on Fish Creek was operated through August 15 instead of through the first week of September. A total of 930 coho had passed the weir during the period of operation. This escapement was encouraging, since these fish were returning from the 1973 brood year, which was one of the lowest escapements ever recorded in the system. Only 210 adults were enumerated in 1973. This low level was believed to be largely the result of severe drought conditions that persisted from 1968-1970. It appears that Fish Creek coho are rebounding from the low escapements experienced in the early 1970's.

Fish and Meadow creeks index areas have been compared to weir counts during previous years. The Fisheries Rehabilitation Enhancement Division now operates a fish production facility in the system and are utilizing native stocks from both Fish and Meadow creeks. Index area counts are no longer usable or necessary in this drainage and will be discontinued.

Considerable physical and chemical data were collected during the past year from numerous lakes and streams. Data includes periodic stream flows, continuous thermograph readings from anadromous fish streams, and dissolved oxygen levels in numerous lakes throughout the Matanuska Valley. These data are available in the Alaska Department of Fish and Game files in the Palmer area office.

DISCUSSION

In 1976 the Fish and Meadow creeks investigation was conducted from June 21 through November 29 with one day in December spent in Index #1. There was a break of three months during this period that occurred between July 26 and October 26 when no trapping was conducted, therefore the data were broken into summer and winter periods. In 1977 the study was conducted from June 20 through October 13. From August 23 to October 4 no sampling was conducted. Upon review of the 1976 and 1977 data it was

Table 16. Numbers of Coho in Escapement Index Areas (Foot Counts), Upper Cook Inlet, 1968-1977.

Stream	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977*
Wasilla (a)			101	104	19	28	30	49	151	
Wasilla (b)			94					158	162	
Cottonwood	22	9	5	29	21	10	2	73	100	25
Birch	125	142	206	138	69	106	49	92	27	96
Fish		852	176	141**	118	75	256	455**	224	160
Meadow	54	109	49	9	27	14	22	7	102***	
Question						59	3	111	126	87
Rabideux								67	91	
Total	201	1,112	631	421	254	292	362	1,012	983	368

* High water conditions prevailed making some escapement counts impossible.

** Due to high water a boat count was necessary.

*** Normal spawner distribution was affected by interruption of normal migrational pattern.

determined that for comparison between the two years data that were broken down by summer and winter periods in 1976 would be combined. The 1976 data, as presented in this report, represents the period of June 21 to November 29, while the 1977 data includes the period of June 20 to October 13. Total trap hours for each year are very similar, with 8,219 hours in 1976 and 8,059 hours in 1977. In 1976 catch rates under the ice appeared to increase which would have some influence in reflecting somewhat higher catch rates in 1976 than would have occurred if the 1976 data represented the exact same time period covered in 1977.

In 1976 concentrations of all salmonids were highest in Index #3, while in 1977 coho salmon was the only salmonid that was most abundant in this area. The highest density of rainbow trout occurred in Index #4 in 1977.

In both 1976 and 1977 coho salmon were most abundant in Index #3, followed in declining order by Index #4, #1, and #2. This consistency indicates where the most desirable coho habitats in Fish and Meadow creeks are located. No apparent habitat preference patterns have appeared for rainbow trout in any of the index areas.

In 1977 coho catches were much higher than in 1976 in all areas except Index #3. Rainbow trout catches in 1977 were lower than in 1976 except in Index #4. Because of the high abundance of coho the species composition in all index areas in 1977 was not similar to what was found in 1976 when rainbow trout were dominant in Index #2. In 1976 it was believed that Index #2 may have been a more desirable rearing area for rainbow trout. This indicates that salmonid species composition in each index area is largely density related and not primarily related to species habitat preferences. In 1977 from 62% to 86% of all salmonids in all index areas were coho salmon. Coho catch rates in 1976 in Index #3 were 2.24 fish/trap hour compared to 2.22 fish/trap hour in 1977. The excess coho in Fish Creek apparently went into Index #1 and #2. In Index #1 catch rates increased from 0.33 in 1976 to 0.71 fish/trap hour in 1977. Index #2 catch rates went from 0.34 fish/hour in 1976 to 0.68 fish/hour in 1977. Coho abundance in 1977 was almost exactly double what was found in Index #1 and #2 in 1976. These data indicate that rearing coho densities in Index #3 may have reached their maximum in both 1976 and 1977. Any increases over the 1977 level of rearing coho may result in a much higher utilization of the lower portion of Fish Creek. The maximum rearing capability of the lower portion of Fish Creek is unknown. There were no apparent migration patterns of coho during the period of the study in 1977.

In 1976 growth rates in the four index areas were not comparable due to a number of factors. One of these factors was the sampling design which allowed for a long time lag in sampling between each index area. In 1977 a more efficient sampling design allowed for comparisons in growth rates between index areas. Age 0+ coho growth rates were slightly higher in Meadow Creek than those recorded in Fish Creek. There was a considerable difference in growth rates of age 1+ coho. Age 1+ coho in Index #4 were much larger than those in all other index areas. This indicates that age 0+ coho in Meadow Creek would have to have a somewhat accelerated growth rate during the winter period than those age 0+ coho in Fish Creek.

Watsjold (1977) stated that despite sampling deficiencies, growth rates of salmonids rearing in Index #4 were definitely greater than in any of the other index areas.

Growth curves could not be developed for rainbow trout since there were only small numbers of age 0+ and I+ rainbow trout captured. Age II+ rainbows have such a wide variation in sizes that a growth curve would not show any seasonal growth features.

In 1976 age 0+ coho were the most dominant age group present even though early in the summer many age 0+ individuals had not reached a size to be effectively captured by minnow traps. In 1976 very few age I+ coho were captured in Fish Creek although they were present in good numbers in Meadow Creek. In 1977 these coho were age I+ and they dominated in all areas except Index #3 where near equal numbers of age 0+ and I+ coho were present.

The apparent increase in rearing coho densities that appears to be taking place in Fish and Meadow creeks may be having an adverse effect on rearing rainbow trout. In 1976 age I+ rainbow trout were the dominant age class and in 1977 these trout were age II+ and again were the dominant age class in all index areas. Only future studies could determine if there is a declining trend in rearing rainbow trout as the densities of coho salmon continue to increase.

The Fisheries Rehabilitation and Enhancement Division released approximately 20,000 age 0+ coho in Big Lake just above the control structure on Fish Creek. A large number of these were marked by a left ventral fin clip. The YCC crews were instructed to check for the fin clip on all coho under 65 mm in length. During the entire sampling period none of these fin clip coho were observed in either Fish Creek or Meadow Creek, which strongly suggests that most of the released coho salmon remained in Big Lake.

The catch rates recorded during the creel census conducted on seven stocked rainbow trout lakes in the Kepler Lake Complex were very poor. The average catch rate for all the lakes was 0.13 rainbow trout/hour. The primary reason for the low catch rates was due to the previous year's stocking program. The majority of rainbow trout that enter a sport fishery are usually one-year-old fish from the previous summer's stocking program. Ennis strains of rainbow trout have been used almost exclusively the last several years and are stocked during the spring period. Swanson River rainbow trout strains are now being utilized which necessitates readjustment in stocking programs since they are not available until late summer. In 1976 Irene, Long, and Matanuska lakes were chosen to receive plantings of several combinations of strains to determine their contribution to the sport fisheries in the Kepler Lakes Complex. Swanson River strains grew so slowly they could not be fin clipped and stocked until early October. Sufficient time had not passed by the spring of 1977 to allow these fish to enter the sport fishery. The majority of rainbow trout caught in the three lakes were from the 1975 spring planting of which there were very few fish left. The catch rates would have been even lower if the 1976 stocked rainbow had not reached a catchable size during the summer months. It wasn't until August that the 1976 plants began entering the fishery. By this time of year

fishing effort had dropped considerably so few of the fish were caught. Fishermen that did fish this late enjoyed fair success.

Canoe Lake had not been stocked with rainbow since 1975 so there were not many rainbow available during the 1977 season. Echo Lake was rehabilitated in 1976 but was stocked with only 1,250 catchables for the summer season. Fishermen had poor success catching them. Kepler and Bradley lakes were the only lakes in the complex that received the normal spring planting in 1976. The reason for poor catch rates on these lakes is not understood, but it may have been related to poor survival of the Ennis strain of rainbow trout.

Victor Lake had the highest catch rates because it contained silver salmon which commonly have high survival rates and which provided a dense population for fishermen. Approximately 25% of the overall seasonal harvest was taken from Victor Lake which comprises only 5% of the complex's total water area. A total of 81,000 planted Ennis trout in interconnected Kepler and Bradley lakes yielded about the same number of fish as the 2,800 coho planted in Victor Lake.

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